

full account of drums or drumlins, which in some way or other are closely related to moraines, the proceedings of the Glacier Conference held at Gletsch in August, 1899, a section on the distinctions and nomenclature of moraines, a glossary and list of synonyms, and indices of authors and subjects. After answering, by quotations from writers, beginning with Sebastian Münster in 1544, the question, What is meant by a glacier? he passes on to moraines, which are at first mentioned casually, without any definite name. This does not appear till rather late in the eighteenth century, about the time of De Saussure. The word, no doubt of patois origin, was not admitted to dictionaries or encyclopedias till well on in the following century. According to Littré its origin is unknown, though it evidently is related to the Low Latin *morena*—bank of stones—which also appears in Italian under the older form, *mora*, and in Piedmontese *murena* designates earth piled in a bank by the side of a field. We also learn that in the German Alps the names *Ganda*, *Gandecken*, *Mårenes* and *Murren* are used, the last perhaps restricted to the Ötztal district. Then follows a long series of abstracts or extracts chronologically arranged from the works of travellers by whom moraines have been noticed or described.

Before the first quarter of the nineteenth century the accounts become definite, von Charpentier in 1819 pointing out that some of the material in a terminal moraine travelled on, some under, the ice. The different varieties are clearly distinguished by F. J. Hugli in 1830, from which time the study assumes a scientific aspect, J. de Charpentier four years later clearly recognising old moraines. They began to be identified in other countries; C. Martins, in 1841, compared the glaciers of Spitzbergen and the Alps, and showed that moraines were also associated with the former. At the same time the study of everything associated with glaciers received a fresh impulse from the investigations of Agassiz, and from this date ground moraine (*grund moräne* or *moraine profonde*) begins to figure in books (though we believe he spoke only of *couche de boue*). Of this, perhaps, not so much is now heard as some quarter of a century ago, when a glacier might have assumed *Diruit*, *Ædificat* as a motto, for it was credited with scooping out a deep lake basin in one place and laying down a thick cushion of "till" in another. The most important additions to knowledge since the valuable summary in Dr. Heim's "Handbuch der Gletscherkunde" (1884) have been Prof. T. C. Chamberlin's observations, completed by his studies in Greenland, that in large glaciers an amount of material, greater than was generally supposed, is transported embedded in the ice (englacial), particularly in the lower part, in which, owing to shearing movements, it often assumes a rude stratification. Thus in certain circumstances, a very remarkable instance of which was described in 1898 by Profs. Garwood and Gregory, materials may even be carried uphill for a certain distance.

Students will find the twenty pages containing a summary of what has been written about drumlins or drums very useful for reference, though whether they will arrive at a clear conviction of how these were formed is less certain. That, however, is the fault of the subject, not of the author, for they are among the greatest puzzles

in glacial geology. In America, in some districts of which they seem to be especially well developed, they form oval hills, occasionally as much as a mile in length, their breadth being about two-thirds of this, and they rise, according to their area, from 25 to 200 feet in height. They are composed of similar material to till, with slight or no signs of stratification, and when numerous show a rude parallelism. The principal facts in regard to their structure are generally admitted, but here unanimity ceases.

We owe a debt of gratitude to the author of this work. In such a subject, indeed in any one connected with glaciers, the task of searching through its literature is most laborious, and as the student often finds hypothetical inferences more abundant than careful descriptions of facts, he is tempted to doubt, as did the charity boy when he got to the end of the alphabet, "whether it was worth going through so much to get to so little." This book, with its summaries and useful indices, will enable him to ascertain what observations are on record and what hypotheses have been formulated. He will also find, in the account of the conference in 1899, the latest classifications proposed (in which, we think, over-minute distinctions are attempted), and will be enabled to begin personal investigations with a general knowledge of previous opinions, more than which is apt to be a hindrance rather than an advantage.

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CHEMISTRY OF PAINTS.

The Chemistry of Pigments. By E. J. Parry and J. H. Coste. Pp. viii + 280. (London: Scott, Greenwood and Co., 1902.) Price 10s. 6d. net.

THIS book is divided into four parts or chapters. The first of these, occupying just seventeen pages, deals with the optical origin of colour; the second chapter, entitled the "Application of Pigments," discusses in separate sections their purely artistic uses, their decorative employment and their protective qualities. These sections are followed by descriptions of the methods of applying pigments, including pastel, water-colour, tempera, oil-painting, ceramic painting, enamelling, glass and mosaic. Large use is made, in the first of these sections of chapter ii., of Russell and Abney's 1888 report on the "Action of Light on Water-Colours," and in the third section of Mr. Harry Smith's recent experiments on the protection against the rusting of iron afforded by many different kinds of paints. The two chapters which constitute the body of the work before us and occupy a couple of hundred pages are entitled respectively "Inorganic Pigments" and "Organic Pigments." Here we find much information of interest and importance in the actual analyses given of individual samples of different pigments and in the notes on methods of examining and testing pigments. But some pigments, such, for instance, as aureolin and cadmium yellow, are treated too summarily in view of their artistic importance, while to other pigments, notably to the large group of "coal-tar lakes," is assigned a treatment which they do not deserve.

And here the question forces itself upon a reviewer's attention, "For what class of readers has this book been written?" The authors speak in their preface of "those who are called upon to use or examine pigments

as a guide to the selection of those which are suitable." If students of art and painters are here meant, we fear that a large part of the information offered for their instruction will be thrown away, for none of them are likely to learn much from such statements as this (p. 258): "The basic colour auramine is imido-tetramethyl-diparadiamido-diphenylmethane." Perhaps, however, Messrs. Parry and Coste intended to address themselves to those who are to "examine pigments" rather than to those using them. If so, the work before us certainly presents, with the limitations of omission and inclusion previously indicated, a convenient compendium of figures and facts. A reasonable critic is averse to making much ado about misprints and mistakes that are akin to misprints, for he knows how provokingly these blots on his work elude the notice even of the really instructed author. But the pages before us seem to be in unusual need of correction. Take these examples: Fraunhofer (pp. 3 and 8) should not have an "e" before the "n," while the "o" ought to be without *umlaut*. It is surely a mistake to attribute to linseed oil a tendency to crack (p. 64). Viridian is the proper form, not vividian and veridian (p. 114). Hydro-lised (p. 115) is incorrect. For arsenate (p. 157, line 31) read arsenite. The formula for gambogic acid, $C_{30}H_{35}O_6$ (p. 271), and that for euxanthic acid, $C_{19}H_{18}OH$ (p. 273), are alike impossible. The table of analyses of Indian yellow (p. 274) is incorrectly reproduced from Thorpe's Dictionary. On p. 231 globorus occurs as a specific name.

Quotations from Church's "Chemistry of Paints and Painting" are numerous, but are handsomely acknowledged.

OUR BOOK SHELF.

Handbook of Sanitation. By George M. Price, M.D. Pp. xi + 317. New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1901. Price 6s. 6d. net.

THE circle of those whose duties compel them to make a special study of sanitary questions is a rapidly widening one in the United States of America, as indeed it is in this country; and one gathers from the author's preface that in spite of the growing number of sanitary inspectors, the still greater number of candidates for inspectorships and the general interest in sanitary questions, there are in America no text-books in which the necessary knowledge is set forth in a concise and suitable form. Of course the sanitary laws and sanitary practice are different in the United States of America, or otherwise we could supply the deficiency from the somewhat extensive literature which exists upon the subject in this country. The general principles of sanitation apply to all countries, but the extent and nature of their application are often determined by legislation of varying character and scope. It is for that reason that many of the English text-books on sanitation are of limited use in America, and that the present volume will only appeal to a few English students.

In part i. of the work a *résumé* is given of sanitary science. The matter is often far too condensed; the important subject of water and water supply is, for instance, dismissed in about seven pages, and in this part, and this part only, there are one or two matters to which exception may be taken:—"Cretinism, as well as goitre, has been traced directly to a certain chemical composition of the soil" (p. 7); the contents of sewers

are the breeding-places for various virulent bacteria . . . and constitute a favourable culture-medium for all other disease-causing organisms"; and in Fig. 22 a "washdown" W.C. is described as a "washout" form.

It is curious for us in this country, where iron house-drains are so rare, to read that the house-drain "should be hung on the cellar-wall or ceiling, unless this is impracticable, as when fixtures in the cellar discharge into it."

Part ii. is on sanitary practice. In this part are given the methods of application of sanitary science in various municipal departments, with extracts from the law, rules and regulations of New York and other municipalities. This constitutes the best part of the book, although here again certain matters (food, disinfection, &c.) are far too sketchily dealt with.

Part iii. of the book relates to the inspector, his duties and qualifications; and part iv. contains, besides useful chapters on sanitary law and sanitary organisation in the United States, extracts from model laws on various branches of sanitation.

Advanced Exercises in Practical Physics. By Prof. Arthur Schuster and Dr. C. H. Lees. Pp. x + 368. (Cambridge: University Press, 1901.) Price 8s.

IN this book the authors describe some seventy exercises in practical physics suitable for students preparing for a B.Sc. degree. The exercises, therefore, deal with elementary subjects, which are described at considerable length; for the authors attach "greater importance to neat and accurate work, properly recorded, than to the number of experiments which a student performs." The title "Advanced" is here used to mean that the work is to be done in a manner befitting an advanced student rather than that the subjects are illustrative of the higher parts of physics.

The contents of the work are divided into six books. The first book contains preliminary matters, amongst which appears the calibration of the spirit-level, which is generally omitted from text-books, although the instrument is one of frequent use. The second book is devoted to mechanics and general physics, and here we are glad to see twenty-four pages on the balance, for the experience of teachers is that students know, as a rule, very little about this important instrument. In the third book heat is the subject, and special stress is put on the proper study of the cooling corrections in calorimetric experiments. If the methods indicated here are carefully carried out, the student should obtain very satisfactory results in his heat measurements. The fourth book contains sound, and the fifth light. In the latter we have a very full discussion of the spectrometer. Polarisation is introduced in two exercises. The sixth book deals with magnetism and electricity.

It is refreshing to read this text-book, for it is not a mere compilation from others, and the teachers and students who use it will feel that they have a guide written by authors who have thoroughly and exhaustively considered the principles and methods of the experiments they are describing. One of the aims of a text-book must be to add to the convenience of the teacher and student in getting at the groundwork of a subject, and this is eminently done in the one before us. The clearness and logical order of the descriptions will greatly facilitate the student's work, and by its use, supplemented with experimental lectures, we think a wide knowledge of physics from the point of view of the facts will be obtained. The diagrams and illustrations are new and exceptionally well done, and the type and get-up of the book are excellent.

The work can be strongly recommended to teachers in schools as a reference book on practical physics, and to university students for general use in the laboratory.

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